

2013–2014 Influenza Hospitalization Report



Oregon Emerging Infections Program
Acute and Communicable Disease Prevention
Oregon Public Health Division

Background

The Oregon Emerging Infections Program (EIP) has conducted surveillance for pediatric influenza hospitalizations in collaboration with the Centers for Disease Control and Prevention (CDC) since 2003. Surveillance for adult influenza hospitalizations was added in 2005.

The objectives of EIP influenza surveillance are to:

- Estimate age-specific hospitalization rates.
- Describe the temporal trends of laboratory-confirmed influenza hospitalization, including by influenza subtype.
- Describe characteristics of persons hospitalized with severe influenza illness.
- Describe the clinical features and course of influenza disease (e.g., severe illness and influenza-associated complications) among persons hospitalized with influenza.

In Oregon, the EIP surveillance area for influenza hospitalizations comprises the tri-county (Clackamas, Multnomah, and Washington) Portland metropolitan area with a population of 1,645,459 in 2010—which is 43% of the population of Oregon.

This report summarizes incidence and severity of influenza in Oregon’s EIP surveillance area during the 2013–2014 influenza season (October 1, 2013 to April 30, 2014).

Methods

Cases are defined as laboratory-confirmed influenza hospitalizations among residents of the EIP area (Clackamas, Multnomah, and Washington counties) that test for influenza within 14 days before or 3 days after admission. Cases are reported by hospitals in the tri-county area. Health record reviews using the EIP case report form are performed by trained nurses, who collected standardized data regarding demographic characteristics, clinical manifestations, underlying conditions, and illness outcomes.

Surveillance Results

Between October 1, 2013 and April 30, 2014, 607 influenza-related hospitalizations were reported in the EIP area—566 adults and 41 pediatric cases. This represents a crude rate of 36.9 cases per 100,000 residents of the EIP area, a rate higher than even the 2009–2010 pandemic season rate (30.3 per 100,000).

Table 1 shows the sex, age, ethnicity, and race of Oregon EIP cases in 2013–2014. The median age of hospitalized cases was 56.0 years—younger than the median age during the 2012–2013 influenza season (median=69.4 years). Persons aged 51–70 years of age were the leading age category in influenza hospitalizations (45.6%). Fifty-two percent of cases were male. Nearly sixty-six percent of cases were reported as white, while blacks—7.1% of hospitalized cases—were the next most frequently reported race (where race was known). Most cases, 73.8%, were reported as non-Hispanic.

Table 1. Characteristics of all Oregon EIP influenza-associated hospitalized cases, 2013–2014.

Sex	No.	Percent
Male	314	51.7
Female	293	48.3
Age		
<6 months	9	1.5
6–23 months	9	1.7
24–59 months	5	0.8
5–10 years	10	1.3
11–17 years	8	1.3
18–30 years	38	6.3
31–50 years	157	25.9
51–70 years	277	45.6
>70 years	94	15.5
Ethnicity		
Hispanic and Latino	36	5.9
Non-Hispanic	448	73.8
Not specified	123	20.3
Race		
White	404	65.6
Black	43	7.1
Asian/Hawaiian or Pacific Islander	23	3.8
American Indian/Alaska Native	6	1.0
Multiple Races	3	<1.0
Unknown	128	21.1

Figure 1 shows the distribution of cases during the influenza season. The peak of influenza-associated hospitalizations occurred during MMWR week 1 of 2014 (the week ending 1/4/2014). During the peak week, 144 influenza hospitalizations were reported. The first cases were reported week 44 (the week ending 11/2/2013), and the last cases reported week 18 (the week ending 5/3/2014).

Figure 1. Number of Oregon EIP influenza-associated hospitalized cases by week, 2013-2014.

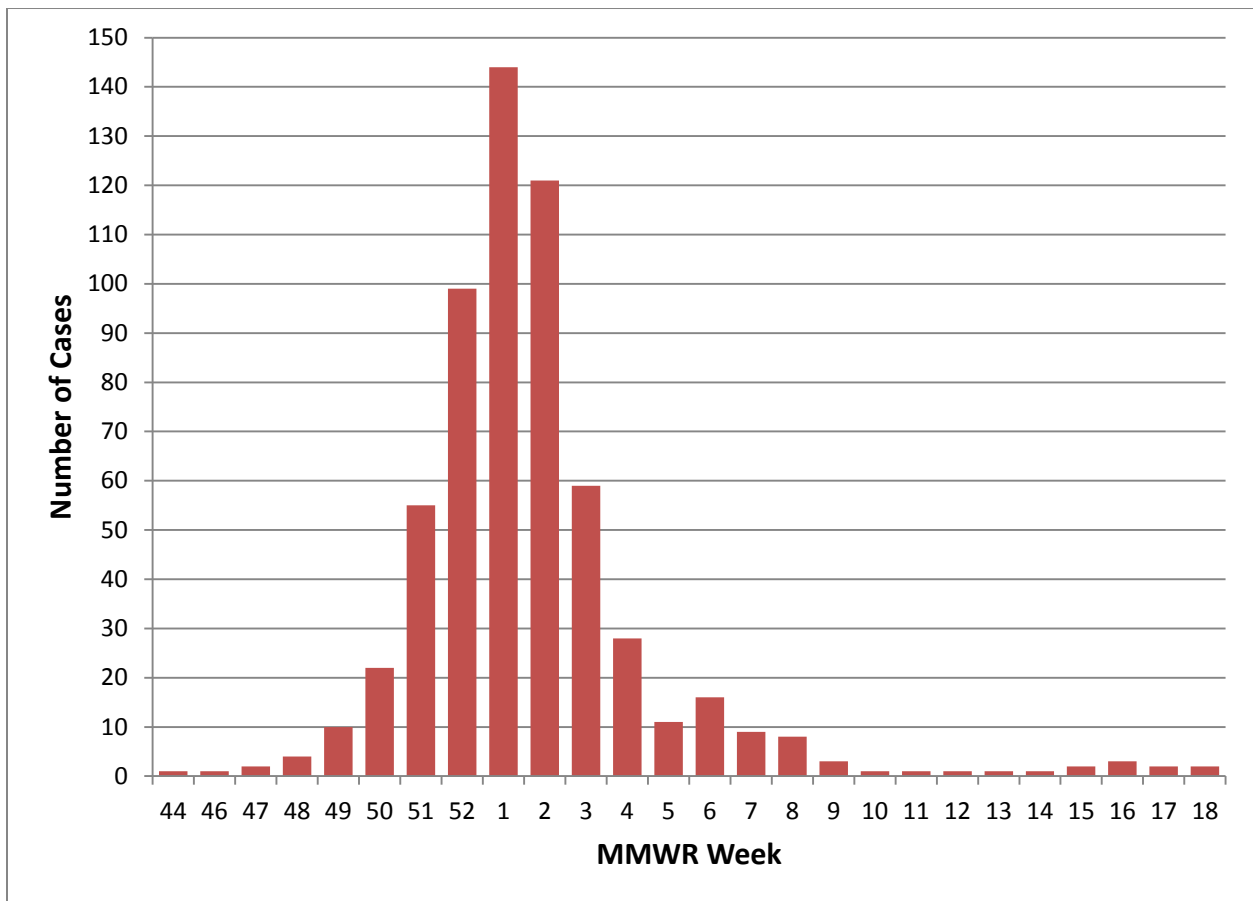


Table 2 shows procedures, conditions, antiviral use, and vaccination status. Nearly all hospitalized cases (96%) underwent a chest x-ray within 24 hours of admission. Approximately 13% required mechanical ventilation and 24% were admitted to an ICU. Most cases had at least one underlying medical condition (93%), with cardiovascular disease (43%), chronic metabolic disease (36%), and chronic lung disease (33%) being the most frequently reported. Only 38% of hospitalized cases were reported as vaccinated for influenza prior to hospitalization.

Table 2. Procedures, conditions, antiviral use, and vaccination status for all Oregon EIP influenza-associated hospitalized cases, 2013–2014.

Procedures, conditions, and findings*	No.	Percent
Chest x-ray within 3 days of admission	583	96.2
Mechanical ventilation	76	12.6
ICU	145	24.0
Treated with Antivirals^{&}	495	81.6
Any Underlying Medical Condition**	562	92.6
Condition		
Cardiovascular disease	261	43.0
Obese***	261	43.0
Chronic metabolic disease	217	35.8
Chronic lung disease	197	32.5
Asthma	154	25.4
Immunosuppressive condition	143	23.6
Neurologic disorder	128	21.1
Renal disease	109	18.0
Hemoglobinopathy	67	11.0
Seizure disorder	33	5.4
Cognitive dysfunction	30	4.9
Pregnant	12	4.3 [‡]
Cancer	18	3.0
History of Guillain-Barre Syndrome	2	<1.0
Vaccinated prior to hospitalization		
Yes	233	38.4
No	337	55.5
Unknown	37	6.1

*Unknown values not shown

**Cases may have more than one underlying condition; categories are not mutually exclusive.

***Obesity calculated using height and weight or where indicated in medical record if height or weight was unknown. Obesity defined as BMI≥30.

[&] Treated with antivirals defined as antiviral treatment during the course of illness.

[‡] Percent of females ≥14 years.

Tables 3 and 4 show demographic characteristics, procedures, and antiviral use for adult cases (persons 18 and older) by vaccination status. Thirty-nine percent of hospitalized adults were reported as vaccinated prior to hospitalization. Women were somewhat more likely to be vaccinated than men (43% vs. 35%). The likelihood of vaccination generally increased with age—62.8% of persons 70 years of age and older were vaccinated prior to hospitalization, compared to the lowest—21.1% among adults 18–30.

Table 3. Characteristics by vaccination status (vaccinated prior to admission) for adult influenza-associated hospitalized cases, Oregon EIP, 2013–2014.

Sex	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Male	171 (59.2)	101 (35.0)	17 (5.9)	289 (51.1)
Female	138 (49.8)	119 (43.0)	20 (7.2)	277 (49.0)
Age				
18–30 years	24 (63.2)	8 (21.1)	6 (8.9)	38 (6.7)
31–50 years	104 (66.2)	39 (24.8)	14 (8.9)	157 (27.7)
51–70 years	150 (54.2)	114 (41.2)	13 (4.7)	277 (48.9)
>70 years	31 (33.0)	59 (62.8)	4 (4.2)	94 (16.6)
Ethnicity				
Hispanic and Latino	16 (53.6)	11 (36.7)	3 (10.0)	30 (5.3)
Non-Hispanic	225 (53.6)	168 (40.0)	27 (6.4)	420 (74.2)
Not specified	68 (58.6)	41 (35.3)	7 (6.0)	116 (20.5)
Race				
White	186 (49.2)	170 (45.0)	22 (5.8)	378 (66.8)
Black	23 (59.0)	13 (33.3)	3 (7.7)	39 (6.9)
Asian or Pacific Islander	16 (76.2)	3 (14.3)	2 (9.5)	21 (3.7)
American Indian/Alaska Native	1 (16.7)	3 (50.0)	2 (33.3)	6 (1.1)
Multiple races	1 (50.0)	1 (50.0)	0 (0.0)	2 (0.4)
Unknown	82 (68.3)	30 (25.0)	8 (6.7)	120 (21.2)

Whites were more likely to be vaccinated compared to several other races (with the exception of American Indian/Alaska Natives and individuals of multiple races, although small numbers prevent a direct comparison between races).

Table 4 shows the frequency and percent of procedures and antiviral use by vaccination status for adult cases. Most adults (93.8%) had at least one underlying condition. Less than half (40.7%) of cases with at least one underlying medical condition were vaccinated prior to admission. Persons with underlying medical conditions are at high risk for adverse medical outcomes related to influenza infection.

Table 4. Procedures, findings and treatment by vaccination status for adult influenza-associated hospitalized cases, Oregon EIP, 2013–2014.

	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Chest X-ray				
Chest X-ray within 3 days	302 (55.0)	213 (38.8)	34 (6.2)	549 (97.0)
No Chest X-ray within 3 days	7 (41.8)	7 (41.8)	3 (17.7)	17 (3.0)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Mechanical ventilation				
Yes	45 (63.4)	20 (28.2)	6 (8.5)	71 (12.5)
No	263 (53.6)	199 (40.5)	29 (5.9)	491 (86.8)
Unknown	1 (25.0)	1 (25.0)	2 (50.0)	4 (0.7)
ICU				
Yes	78 (59.5)	41 (31.3)	12 (9.2)	131 (23.1)
No	230 (53.1)	179 (41.3)	24 (5.5)	433 (76.5)
Unknown	1 (50.0)	0 (0.0)	1 (50.0)	2 (0.4)
Treated with Antivirals^{&}				
Treated	257 (55.3)	183 (39.4)	25 (5.4)	465 (82.2)
Not treated	52 (51.5)	37 (36.6)	12 (11.9)	101 (17.8)
Any medical condition				
None or unknown	27 (77.1)	4 (11.4)	4 (11.4)	35 (6.2)
At least one	282 (53.1)	216 (40.7)	33 (6.2)	531 (93.8)
Type of medical condition				
Asthma	80 (54.1)	59 (39.9)	9 (6.1)	148 (25.2)
Cancer	10 (55.6)	6 (33.3)	2 (11.1)	18 (3.2)
Cardiovascular disease	107 (42.1)	133 (52.4)	14 (5.5)	254 (44.9)
Chronic lung disease	78 (40.4)	109 (56.5)	6 (3.1)	193 (34.1)
Chronic metabolic disease	95 (44.4)	110 (51.4)	9 (4.2)	214 (37.8)
Cognitive dysfunction	11 (39.2)	17 (60.7)	0 (0.0)	28 (5.0)
Hemoglobinopathy	33 (49.3)	31 (46.3)	3 (4.5)	67 (11.8)
History of Guillain-Barre Syndrome	1 (50.0)	1 (50.0)	0 (0.0)	2 (0.4)
Immunosuppressive condition	58 (41.7)	76 (54.7)	5 (3.6)	139 (24.6)
Neurologic condition	57 (48.3)	57 (48.3)	4 (3.4)	118 (20.9)
Obese ^{**}	144 (55.4)	102 (39.2)	14 (5.4)	260 (45.9)
Pregnant [‡]	4 (36.4)	6 (54.6)	1 (9.1)	11 (4.0)
Renal disease	44 (40.4)	61 (56.0)	4 (3.7)	109 (19.3)
Seizure disorder	9 (32.1)	16 (57.1)	3 (10.7)	28 (5.0)

*Cases may have more than one underlying condition; categories are not mutually exclusive. Not all categories or subcategories shown.

**Obesity calculated using height and weight or where indicated in medical record if height or weight was unknown. Obesity defined as BMI≥30.

& Treated with antivirals defined as antiviral treatment during the course of illness.

‡Percent pregnant includes only adult females in denominator.

Tables 5 and 6 show demographic characteristics, procedures, and antiviral use for pediatric cases by vaccination status. Most hospitalized children—72% of males and 63% of females—were not vaccinated prior to being hospitalized for influenza. Thirty-one (76%) of the 41 hospitalized children had underlying medical conditions; only 12 (39%) of those children were vaccinated.

Table 5. Case characteristics by vaccination status (vaccinated prior to admission) for pediatric influenza-associated hospitalized cases, Oregon EIP, 2013–2014.

Sex	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Male	18 (72.0)	7 (28.0)	0 (0.0)	25 (61.0)
Female	10 (62.5)	6 (37.5)	0 (0.0)	16 (39.0)
Age				
<6 months	9 (100.0)	0 (0.0)	0 (0.0)	9 (22.0)
6–23 months	4 (44.4)	5 (55.6)	0 (0.0)	9 (22.0)
24–59 months	5 (100.0)	0 (0.0)	0 (0.0)	5 (12.2)
5–10 years	7 (70.0)	3 (30.0)	0 (0.0)	10 (24.4)
11–17 years	3 (37.5)	5 (62.5)	0 (0.0)	8 (19.5)
Ethnicity				
Hispanic and Latino	1 (16.7)	5 (83.3)	0 (0.0)	6 (14.6)
Non-Hispanic	21 (75.0)	7 (25.0)	0 (0.0)	28 (68.3)
Not specified	6 (85.7)	1 (14.3)	0 (0.0)	7 (17.1)
Race				
White	17 (65.4)	9 (34.6)	0 (0.0)	26 (63.4)
Black	3 (75.0)	1 (25.0)	0 (0.0)	4 (9.8)
Asian or Pacific Islander	2 (100.0)	0 (0.0)	0 (0.0)	2 (4.9)
American Indian/Alaska Native	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Multiple Races	0 (0.0)	1 (100.0)	0 (0.0)	1 (2.4)
Unknown	6 (75.0)	2 (25.0)	0 (0.0)	8 (19.5)

Table 6. Procedures, underlying conditions, and antiviral use by vaccination status for pediatric influenza-associated hospitalized cases, Oregon EIP, 2013–2014.

	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Chest X-ray				
Chest X-ray within 3 days	25 (73.5)	9 (26.5)	0 (0.0)	34 (82.9)
No Chest X-ray within 3 days	12 (75.0)	4 (25.0)	0 (0.0)	6 (14.6)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.4)
Mechanical ventilation				
Yes	4 (80.0)	1 (20.0)	0 (0.0)	5 (12.2)
No	24 (66.7)	12 (33.3)	0 (0.0)	36 (87.8)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
ICU				
Yes	11 (78.6)	3 (21.4)	0 (0.0)	14 (34.2)
No	17 (63.0)	10 (37.0)	0 (0.0)	27 (65.9)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Treated with Antivirals^{&}				
Treated	21 (70.0)	9 (30.0)	0 (0.0)	30 (73.2)
Not treated	7 (63.6)	4 (36.4)	0 (0.0)	11 (26.8)
Any medical condition				
None or unknown	9 (90.0)	1 (10.0)	0 (0.0)	10 (24.4)
At least one	19 (61.3)	12 (38.7)	0 (0.0)	31 (75.6)
Type of medical condition[‡]				
Asthma	4 (66.7)	2 (33.3)	0 (0.0)	6 (14.6)
Chronic lung disease	1 (25.0)	3 (75.0)	0 (0.0)	4 (9.8)
Cardiovascular disease	2 (28.6)	5 (71.4)	0 (0.0)	7 (17.1)
Chronic metabolic disease	2 (66.7)	1 (33.3)	0 (0.0)	3 (7.3)
Renal disease	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cancer	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Immunosuppressive condition	3 (75.0)	1 (25.0)	0 (0.0)	4 (9.8)
Neurologic condition	6 (60.0)	4 (40.0)	0 (0.0)	10 (24.4)
Seizure disorder	2 (40.0)	3 (60.0)	0 (0.0)	5 (12.2)
Hemoglobinopathy	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

* Cases may have more than one underlying condition; categories are not mutually exclusive. Not all categories or subcategories shown.

[&] Treated with antivirals defined as antiviral treatment during the course of illness.

During the 2013–2014 influenza season, the predominant viruses that circulated in Oregon included A/California/7/2009-like (H1N1), A/Texas/50/2012-like (H3N2), and influenza B (the Oregon State Public Health Laboratory does not test for strain but 99.7% of B viruses tested at CDC were B/Massachusetts/2/2012-like). Both influenza A viruses and the influenza B virus in circulation in 2013–2014 were all components of the

2013–2014 influenza vaccine for the Northern Hemisphere. CDC estimated that getting a flu vaccine during the 2013–2014 season reduced the risk of having to go to the doctor because of the flu by 60% for both children and adults.

Table 7 shows the frequency of virus types and subtypes detected among influenza-associated hospitalized cases in the Oregon EIP area. Influenza A (H1N1) was detected in 83.5% of all hospitalizations, and in 98.4% of the specimens that were subtyped. Influenza A (H3N2) was detected in 1.2% of hospitalizations. Just 2.3% of hospitalizations were associated with influenza B.

Table 7. Influenza virus types and subtypes among Oregon EIP influenza-associated hospitalized cases, 2013–2014.

Virus	No.	Percent
Influenza A	592	97.5
H3	7	1.2
2009 H1	507	83.5
Unknown subtype*	78	12.8
Influenza B	14	2.3
Both A and B	1	0.2
Type unknown ⁺	0	0.0
Total	607	100

⁺type unknown: influenza type not reported in medical records.

*Specimen not subtyped.

The age distribution of hospitalized cases in 2013–2014 varied from the five previous influenza seasons (Figure 2). In 2013–2014, the highest rate of hospitalization occurred among persons 65 years and older; this was the case for the previous three seasons (2012–2013, 2011–2012, 2010–2011). During 2009–2010 (pandemic year) and 2008–2009 the highest rates of hospitalization occurred among children 0–4 years of age. Adults aged 50–64 both saw a substantially increased rate of hospitalization compared with previous seasons—68.9 per 100,000 during 2013–2014. Adults aged 18–49 saw a rate similar to that of the 2009–2010 pandemic year, which was much greater than the previous three seasons.

Deaths: There were 17 deaths among adults hospitalized in 2013–2014, which was 2.8% of all hospitalizations, and no deaths among pediatric patients in the Oregon EIP catchment area. This percent of deaths among hospitalized patients is comparable to the previous season (2012–2013) of 3.2%. Data on deaths includes only those who died while hospitalized.

Figure 2. Oregon EIP influenza-associated hospitalized cases by age group, comparison by influenza season, 2008–2009 to 2013–2014.

